

ART. X.—*On the best Form for a Balance Beam.*

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On the 13th May, 1880,* I submitted to this Society a paper on the above subject in which the problem of designing a balance beam of minimum mass for a given strength and rigidity was discussed, and a form was suggested very different from those in general use. This result was arrived at purely by mathematical reasoning. It appeared at the time desirable to verify this reasoning by actual experiment, and models were prepared for the purpose, but the appliances for making the experiments being of a very imperfect kind difficulties arose in making the tests, and the whole matter was laid aside. Recently, however, there has been an opportunity of reopening the question, and with the aid of the large and very perfect testing machine belonging to the Engineering department of the University, a number of experiments have been made which I now propose to describe, and which bear out the conclusions of the paper. Four models were obtained of cast gun metal, and of about the same weight. Two of these represented the form advocated in the paper, while the others represented the type shown by Fig. II. in the diagram (see p. 22, of vol. xvii., Transactions).

The results were as follow, the beams being one foot long :—

	Load at each end of beam at moment of failure.	Ultimate deflection.
1. Design advocated, Fig. 3 of diagram. Weight } 12½ oz. ... }	... 882lbs. ...	·06 inch.
2. Design advocated, Fig. 3 of diagram. Weight } 13¾ oz. ... }	... 1035lbs. ...	·07 inch.
3. Old form, Fig. 2 of dia- gram. Weight 12½ oz. }	... 413lbs.4 inch.

* Transactions of the Royal Society of Victoria, vol. xvii., p. 19.

		Load at each end of beam at moment of failure.		Ultimate deflection.
4. Old form, Fig. 2 of dia-	gram. Weight $12\frac{1}{2}$ oz. }	... 495lbs.	...	·5 inch.

In experiment 4 the beam was placed between boards connected by bolts, in order to check a tendency to bend sideways that had been noticed in experiment 3. This precaution led to a considerable increase of strength, as is shown by comparing the results of experiments of 3 and 4.

As the above beams were not all of exactly the same weight the readiest way of determining their relative merits is by finding how many times its own weight each beam carried. These results, obtained by dividing the load carried by the weight of the beam, are: 1131, 1203, 529 and 634 respectively, showing the enormous superiority of the proposed type.